PROGRAM facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas and Oil

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OIL EXPLORATION & PRODUCTION PROGRAM ENVIRONMENTAL SCIENCE

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Description

The Environmental Science area of the Oil & Gas Environmental Program is concerned primarily with air emissions, soil remediation, and waste management. The overall program mission is to improve environmental performance in the oil and gas industry while at the same time reducing the cost of effective environmental protection. The goal of Environmental Science is to provide sound science to enable industry to achieve this mission.

DOE-funded projects work with the EPA and individual states to provide sound scientific data on regulatory controls for air emissions, soil remediation and proper handling, and disposal of waste streams.

Environmental Science research can expand the capabilities of State and Federal governments to promote common sense in environmental regulation by making more cost-effective, risk-based decisions

Air Emissions

Clean air is a vital concern to the American public. The high cost of meeting environmental regulations for clean air places a substantial economic burden on communities and the petroleum industry.

New technologies to identify air emissions, determine their spread and effects, and counter those effects are being developed. The goal for the Air Emissions program is to develop and demonstrate models for air chemistry and dispersion that accurately reflect the effects of petroleum exploration and production and processing operations on regional air quality and visibility by the year 2012. Rapid increases in computer power are helping to improve monitoring methods and ease their adoption by various state and federal agencies, as data-gathering methods and data-sharing become more feasible.

Recent successes from the Air Emissions program include the Clean Airship in California and monitoring programs developed in cooperation with the Bureau of Land Management. The Clean Airship is a remotely piloted, 30-foot blimp used in a DOE co-funded study to monitor and identify sources of air pollution over the Central Valley of California. The blimp collects air samples and can operate at a low altitude (1,000 feet) even on foggy days or over difficult terrain when traditional fixed-wing aircraft are unsafe to fly. The air quality samples are used to monitor and plan compliance-related issues.

Soil Remediation

DOE's strategy for the Soil Remediation program is to reduce clean-up costs by demonstrating the viability of timely remediation and by establishing ecologically based clean-up targets rather than cleaning to non-detectable levels in every case.

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Projects conducted through the Petroleum Environmental Research Forum (PERF) and regulators worked to determine environmentally acceptable end-points for clean-up targets and to develop protocols for ecological-risk assessments. The objective of protocols and risk assessments is to optimize bioremediation strategies.

DOE's goal is to reduce the cost of remediating soils contaminated with crude oil or refined products by 15% by 2012 from 1990 levels.

One highlight of the Soil Remediation program was a series of tests and field demonstrations conducted by the University of Tulsa in Osage County, OK, on bioremediation of oil and brine spill contamination. Landfarming using natural microorganisms was the most effective and lowest-cost treatment for removing contaminants from the soil. The microorganisms needed fertilizer, moisture, good soil structure, and warm temperature for landfarming. After initial removal of oil and waste contaminants, the soil was fertilized, spread with hay, and plowed to aerate, retain moisture better, and provide surface area for the microbes to work. The procedure was repeated monthly during warm weather. Demonstrations showed that in 1-2 years crop growth would return to normal. In conjunction with the International Petroleum Environmental Conference, the Oklahoma Energy Resources Board, and EPA, workshops were conducted throughout Oklahoma expounding these successful methods and providing soil test kits.

Waste Management

Waste products from petroleum production and processing create a significant disposal problem for industry and may be cause for public concern over health issues. The objective of the Waste Management Program is to establish a reliable scientific basis for clean-up procedures and guidelines for allowable levels of wastes. These procedures and guidelines were developed through PERF in collaboration with EPA.

Waste Management projects were designed to develop a variety of methods to handle, minimize, and dispose of petroleum wastes, including thermal treatment, biological treatment, discharge of water from offshore platforms, reuse of solids for fill dirt and road cover, offsite landfilling, wetlands rehabilitation, and subsurface injection. Disposal in salt caverns and slurry injection techniques were developed to provide alternatives to traditional subsurface reinjection and to provide more-efficient, cost-effective reinjection methods.

With the significant increase in wastewater streams generated by coalbed natural gas development the Produced Water Program was initiated out of the Waste Management Program.

Benefits

The Nation benefits from the Environmental Science Program through the establishment of cost-effective, scientifically based petroleum industry standards for air emissions, soil remediation, and waste management that render more oil and gas resources economically recoverable without compromising environmental protection.

The program demonstrated that air quality can be improved through a focus on monitoring existing conditions, developing models to determine “best practices,” developing technologies to alleviate problems, and assisting with improvement of regulatory issues.

Low-cost, effective, and simple soil remediation procedures were developed and taught to independent oil operators and landowners in Oklahoma. The methods are applicable to any small oil or brine spill common to the Midcontinent region.

Waste management technologies and strategies were developed under the program to handle a variety of crude oil and contaminated waste streams, ranging from disposal of produced water to NORM (naturally occurring radioactive material).